

# Advanced Approaches to Greatly Reduce Hydrogen Gas Crossover Losses in PEM Electrolyzers Operating at High Pressures and Low Current Densities, Phase II

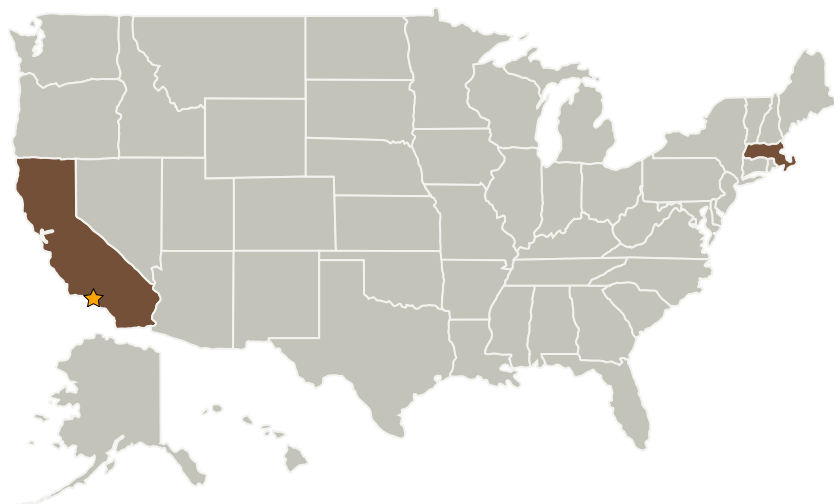
Completed Technology Project (2009 - 2011)



## Project Introduction

ElectroChem proposes a Phase II program to advance its very successful SBIR Phase I technology effort to the point of minimum hydrogen loss through the electrolyzer membrane, while the high proton conductivity necessary for high efficiency water electrolysis is maintained. In Phase I, ElectroChem demonstrated that its concept of adding clay to a Nafion proton conductive membrane would significantly reduce the penetration of hydrogen gas through the membrane. In Phase II, a comprehensive technology effort (aimed at optimization) will be carried out which uncovers the microscopic changes that occur within the membrane as a result of the clay addition. The objective of this effort is first to correlate the microscopic morphology that occur within the Nafion-clay nanocomposite membranes with the reduction in hydrogen penetration produced by the clay addition. A second objective is to control the microscopic morphology and establish a process to develop the most effective Nafion-clay nanocomposite membranes, leading to advanced MEAs. The final objective is to evaluate the Nafion-clay nanocomposite membranes under high pressure Commercial Electrolyzer conditions. Successful completion of this effort will enable NASA to meet its requirement for an electrolyzer that will operate very efficiently both at low current densities and at high pressures.

## Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
★ Jet Propulsion Laboratory (JPL)	Lead Organization	NASA Center	Pasadena, California
ElectroChem, Inc.	Supporting Organization	Industry Minority-Owned Business, Women-Owned Small Business (WOSB)	Woburn, Massachusetts

## Primary U.S. Work Locations

California	Massachusetts
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## Project Transitions

**February 2009:** Project Start**February 2011:** Closed out

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

Carlos Torrez

## Technology Areas

### Primary:

- TX14 Thermal Management Systems
  - └ TX14.1 Cryogenic Systems
    - └ TX14.1.3 Thermal Conditioning for Sensors, Instruments, and High Efficiency Electric Motors